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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/699,894	10/30/2000	Mukund Padmanabhan	YOR20000388US1 (590.022)	7224
35195 7590 07/16/2008 FERENCE & ASSOCIATES LLC 409 BROAD STREET PITTSBURGH, PA 15143			EXAMINER HAN, QI	
			ART UNIT 2626	PAPER NUMBER
			MAIL DATE 07/16/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/699,894	PADMANABHAN ET AL.	
	Examiner	Art Unit	
	QI HAN	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02/14/2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-7,10-14,17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-7,10-14,17 and 18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Amendment

2. This communication is responsive to the applicant's amendment filed on 02/14/2008. The applicant amended claims 1, 7 and 13 (see the amendment: pages 2-5).

The examiner withdraw the previous claim rejection under 35 USC 112 1st, because the applicant amended the corresponding claims. However, the newly amended claim introduced new issue/matter, so that the claims are still rejected under new ground rejection (see below).

Response to Arguments

3. Applicant's arguments filed on 02/14/2008 with respect to the claim rejection, have been fully considered but are moot in view of the new ground(s) of rejection, since the newly amended claims introduce new issue (or new matter) that change the claim scope (see below).

Regarding the previous disclosure objection, the applicant refused the examiner's requirement to provide related prior art information (Fukunaga), because the applicant believes that the Fukunaga is well known background material and is not material to the patentability of the instantly claimed invention (Remarks: page 8, paragraph 1). It should be pointed out that the detailed description in the specification, such as content on page 7, lines 13-15, and the claimed limitation, such as LDA, are the related the contribution of

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Fukunaga. Therefore, the applicant's statements regarding this issue will be record and treated as part of the prior art disclosure.

In response to applicant's arguments regarding the rejection of claim 18 under 35 USC 112 2nd (see Remarks: page 10, paragraph 2), the examiner respectfully sustains the rejection, because even though the arguments provide commonly understood definitions of the variables, the variables **in the claim** are still, in fact, undefined (i.e. indefinite).

It is also noted that the previous cited the references are still applicable to the newly amended claims for the prior art rejection.

In response to the applicant's arguments based on the newly amended claims (see Remarks: page 11, paragraph 3 to page 13, paragraph 2), it is noted that Watanabe teaches well know technique using 'conventional feature extraction', 'which transforms an inputted signal pattern' in 'one feature space' that 'is given commonly to all the classes' (col. 2, lines 4-10); and Decell discloses 'performing the transformation $y=Bx$ ' such that 'n-dimensional classification problem transformed into a k-dimensional problem' and 'the minimal probability of misclassification resulting from applying a maximum likelihood classification procedure' (page 3B-1, section 1 Introduction); defining 'the average divergence for m classes' and 'B-average divergence' (D_B) (corresponding to the objective function) 'to maximize D_B ' by using 'transformation $y=Bx$ ' (wherein B is k x n matrix, i.e. n--k dimensions, read on over all dimensions) for 'all distinct class pairs' (page 3B-2, paragraphs 2-4; page 3B-5, lines 15-24, including equations regarding D_B and S_i), and 'analytically computing a bound on the probability of misclassification, computed in range space of the matrix B' and 'considering a distinct linear discriminate function' (corresponding to LDA) (page 3B-9, paragraph 4), wherein

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Decell's disclosure inherently include one feature space transformation for all classes, as argued. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine teachings of Watanabe and Decell by using conventional feature transformation in one feature space for all classes and maximizing b-average divergence (D_B) using matrix B for all distinct class pairs for the classification, for the purpose (motivation) of providing minimal probability of misclassification and/or reducing classification time (Decell: page 3B-1, introduction).

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1, 4-7, 10-14 and 17-18 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding claim 1, it claims "a method", which appears, in the surface, to fall within statutory classes (i.e. a process). However, by reviewing the body of the claimed language, the terms "pattern", "feature", "classes" and "classifier", "matrices (or matrix)" can be interpreted as pure data in a broad sense, so that the claim, as whole, is substantially drawn to or reasonably interpreted as manipulating pure (abstract) data or algorithm, which falls within 35 USC 101 Judicial Exceptions, i.e. abstract idea. Further, since the claim, as whole, only involves or manipulates pure (abstract) data or algorithm and the results is in the same or similar abstract nature, it lacks to produce a useful,

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tangible, **and** concrete result in a **practical application**. Therefore, the claim, as whole, is directed to non-statutory subject matter.

Regarding claim 7, it claims “an apparatus”, which appears, in the surface, to fall within statutory classes (i.e. a machine). However, by reviewing the body of the claimed language, the terms “pattern”, “feature”, “classes” and “classifier”, “matrices (or matrix)” can be interpreted as pure data in a broad sense, so that the claim, as whole, is substantially drawn to or reasonably interpreted as manipulating pure (abstract) data or algorithm, which falls within 35 USC 101 Judicial Exceptions, i.e. abstract idea. Further, since the claim, as whole, only involves or manipulates pure (abstract) data or algorithm and the results is in the same or similar abstract nature, it lacks to produce a useful, tangible, **and** concrete result in a **practical application**. Therefore, the claim, as whole, is directed to non-statutory subject matter.

Regarding claim 13, it claims “a program storage device”, which appears, in the surface, to fall within statutory classes (i.e. a machine). However, by reviewing the body of the claimed language, the terms “pattern”, “feature”, “classes” and “classifier”, “matrices (or matrix)” can be interpreted as pure data in a broad sense, so that the claim, as whole, is substantially drawn to or reasonably interpreted as manipulating pure (abstract) data or algorithm, which falls within 35 USC 101 Judicial Exceptions, i.e. abstract idea. Further, since the claim, as whole, only involves or manipulates pure (abstract) data or algorithm and the results is in the same or similar abstract nature, it lacks to produce a useful, tangible, **and** concrete result in a **practical application**. Therefore, the claim, as whole, is directed to non-statutory subject matter.

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Regarding claims 4-6, 10-12, 14 and 17-18, the rejection is based on the same reason described for claim 1 and 7, because the dependent claims include the same or similar problematic limitations as their respective parent claims.

5. To expedite a complete examination of the instant application the claims rejection under 35 U.S.C 101 (nonstatutory) above are further rejected as set forth below in anticipation of applicant amending these claims to place them within the four statutory categories of invention.

Claim Rejections - 35 USC § 112

6. Claims 1, 4-7, 10-14 and 17-18 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claims 1, 7 and 13, the limitation “wherein the optimizing is carried out in an unconstrained manner over all possible matrices”, introduces new subject matter, because the limitation is not specifically described in the original specification. It is noted that the referenced contents in the specification (page 15) provided by the applicant (see Remarks: page 12) do not fully support the newly amended limitation.

Regarding claims 4-6, 10-12, 14 and 17-18, the rejection is based on the same reason described for claims 1 and 7, because the dependent claims include the same problematic limitations as their parent claims.

7. Claims 1, 4-7, 10-14 and 17-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 1, 7 and 13, the newly added limitation of “wherein the optimizing is carried out in an unconstrained manner over all possible matrices” conflicts with another newly added limitation of “wherein the objective function is initialized with an LDA matrix” that constrains a matrix (one of all possible matrices) being LDA, so that the claim is indefinite. Further, it is noted that the argued statements (see Remarks: page 12, paragraph 3 to page 13, paragraph 1) show the conflicted limitations and support the examiner's above rejection.

Regarding claims 4-6, 10-12, 14 and 17-18, the rejection is based on the same reason described for claims 1 and 7, because the dependent claims include the same problematic limitations as their parent claims.

In addition, regarding claim 18, none of the variables in the claimed equation is defined so that the variables themselves and the equation are indefinite. It is noted that the claim is interpreted in light of the specification, but not read into the specification. It is also noted that, even though the arguments provides commonly understood definitions of the variables (see Remarks: page 10, paragraph 2), the variables **in the claim** are still, in fact, undefined, so that the corresponding limitation is indefinite.

Claim Rejections - 35 USC § 103

8. Claims 1, 4-7, 10-14 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (US 5,754,681 A) hereinafter referenced as Watanabe in view of Decell et al. (IDS: “An iterative approach to the feature selection problem, Machine Processing of remote sensing data, 1972) hereinafter referenced as Decell.

As per **claim 1**, as best understood in view of the rejection under 35 U.S.C. 112 1st and 2nd (see above), Watanabe discloses ‘signal pattern recognition comprising parameter training controller for training feature conversion parameters and discriminant functions’ (title), comprising:

“inputting a pattern” (Fig. 1, 200; Fig. 2, ‘inputted signal pattern’);

“transforming the input pattern to provide a set of at least one feature for a classifier which classifies into classes, [wherein there is only one feature space transform for all classes]” (Fig. 2; col. 1, lines 30-42, ‘transform an inputted signal pattern...into a feature value, or a low-dimension information (one feature space transform) representing a class’);

“minimizing the probability of subsequent misclassification of at least one feature in the classifier” (col. 18 lines 9-24, Fig. 7 steps 4-5, col. 23 lines 50-59 and col. 24 lines 15-30); comprising:

“developing an objective function, [wherein said objective function maximizes an average pairwise divergence]”, (col. 18 lines 59-68); and

“optimizing the objective function through gradient descent, [wherein all dimension of a matrix are optimizing the objective function, wherein the optimizing is carried out in an unconstrained manner over all possible matrices;

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and wherein the objective function is initialized with an LDA matrix]”, (col. 19 lines 1-10, ‘gradient method such as a steepest descent method in a batch processing’).

It is noted that Watanabe focuses his transformation in a plurality of feature spaces (not one feature space), and does not expressly disclose “said objective function maximizes an average pairwise divergence” and “wherein all dimension of a matrix are optimizing the objective function, wherein the optimizing is carried out in an unconstrained manner over all possible matrices; and wherein the objective function is initialized with an LDA matrix”. However, Watanabe teaches well known technique using ‘conventional feature extraction’, ‘which transforms an inputted signal pattern’ in ‘one feature space’ that ‘is given commonly to all the classes’ (col. 2, lines 4-10). Further, the feature of maximizing an average pairwise divergence and optimizing the objection function was well known in the art as evidenced by Decell who discloses ‘an iterative approach to the feature section problem’ (title) providing ‘the b-average divergence for m-distinct classes’ (abstract), comprising ‘performing the transformation $y=Bx$ ’ such that ‘n-dimensional classification problem transformed into a k-dimensional problem’ and ‘the minimal probability of misclassification resulting from applying a maximum likelihood classification procedure’ (page 3B-1, section 1 Introduction); defining ‘the average divergence for m classes’ and ‘B-average divergence’ (D_B) (corresponding to the objective function) ‘to maximize D_B ’ by using ‘transformation $y=Bx$ ’ (wherein B is k x n matrix, i.e. n--k dimensions, read on over all dimensions) for ‘all distinct class pairs’ (interpreted as average pairwise divergence) (page 3B-2, paragraphs 2-4; page 3B-5, lines 15-24, including equations regarding D_B and S_i), and

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‘analytically computing a bound on the probability of misclassification, computed in range space of the matrix B’ and ‘considering a distinct linear discriminate function’ (corresponding to LDA) (page 3B-9, paragraph 4), which can be broadly read on the claimed limitations. In addition, it is noted that Decell’s disclosure necessarily and/or inherently satisfied the limitation of “one feature space transformation for all classes” as claimed. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine teachings of Watanabe and Decell by using conventional feature transformation in one feature space for all classes and maximizing b-average divergence (D_B) using matrix B for all distinct class pairs for the classification, for the purpose (motivation) of providing minimal probability of misclassification and/or reducing classification time (Decell: page 3B-1, introduction).

As per **claim 4** (depending on claim 1), Watanabe in view of Decell further discloses “querying whether the optimized objective function converges” (Watanabe: col. 21 lines 18-21; Decell: page 3B-9, last paragraph of the section 3 Numerical Results and Fig. 1).

As per **claim 5** (depending on claim 4), Watanabe in view of Decell further discloses “repeating an optimizing step if the optimized objective function does not converge” (Watanabe: col. 24 line 22; Decell: page 3B-5, last line and title).

As per **claim 6** (depending on claim 1), Watanabe in view of Decell further discloses “pattern recognition is speech recognition” (Watanabe: col. 1, lines 10-15).

As per **claim 7**, it recites an apparatus. The rejection is based on the same reason described for claim 1, because the claim recites the same or similar limitations as claim 1.

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As per **claims 10-12** (depending on claim 7), the rejection is based on the same reason described for claims 4-6, because the claims recite the same or similar limitations as claims 4-6 respectively.

As per **claim 13**, it recites a program storage device. The rejection is based on the same reason described for claim 1, because the claim recites the same or similar limitations as claim 1.

As per **claim 14** (depending on claim 1), Watanabe in view of Decell further discloses “wherein said objection function is an average pairwise divergence related to the probability of is classification of the projected space based on classes having uniform prior probabilities” (Watanabe: col. 18 lines 7-35 and 54-67; Decell: page 3B-2 and 3B-5, wherein “average divergence” and the term “ $c=2/m(m-1)$ ” imply m classes having uniform prior probabilities).

As per **claim 17** (depending on claim 1), Watanabe in view of Decell further discloses “said objection function comprises means, covariance, and prior probabilities” (Watanabe: (col. 16 lines 32-45 and 63-67; Decell: page 3B-2 and 3B-5, equations regarding D_B and S_i).

As per **claim 18** (depending on claim 1), Watanabe in view of Decell further discloses “said objection function comprises means, covariance, and prior probabilities (Decell: page 3B-2 and 3B-5, equations regarding D_B and S_i).

Conclusion

9. Please address mail to be delivered by the United States Postal Service (USPS) as follows:

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to QI HAN whose telephone number is (571)272-7604. The examiner can normally be reached on M-TH:9:00-17:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571)-272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

QH/qh
July 14, 2008
/Qi Han/
Examiner, Art Unit 2626